_C_L_A_I_M_S_

1. In combination for operating upon analog signals transmitted through a coaxial cable providing quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the coaxial cable,

first means for converting the analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide the digital signals with a quadrature phase relationship,

third means for passing the low frequency components in the digital signals with the quadrature phase relationship, and

fourth means for derotating the digital signals passed by the third means to recover, in digital form, the quadrature amplitude modulated data from the noise and distortions in the coaxial cable.

2. In a combination as set forth in claim 1,

the fourth means including fifth means for multiplying the output from the third means by trigonometric signals in a quadrature phase relationship to provide for a recovery in digital form of the quadrature amplitude modulated data from the noise and distortions in the coaxial cable.

3. In a combination as set forth in claim 2,

sixth means for equalizing the derotated signals from the fourth means, and

seventh means responsive to the outputs from the fourth means and the sixth means for providing a servo

feedback to the fourth means to adjust the phases of the trigonometric signals from the fifth means for facilitating the recovery of the quadrature amplitude modulated data by the fourth means from the noise and distortions in the coaxial cable.

4. In a combination as set forth in claim 3,

means for obtaining the recovery of the phase and amplitude modulations in the coaxial cable at the output of the sixth means.

5. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise in the coaxial cable,

first means for converting the analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship to the other of the digital signals in the pair,

third means for derotating the digital signals in the pair, and

fourth means for equalizing the derotated signals from the third means.

6. In a combination as set forth in claim 5,

fifth means responsive to the signals from the third means and the fourth means for servoing the operation of the third means to facilitate the derotation of the digital signals in the pair.

7. In a combination as set forth in claim 5,

the signals in the coaxial cable including carrier signals having a carrier frequency,

fifth means for producing signals having a variable frequency, and

sixth means responsive to the signals from the second means for varying the frequency of the signals from the fifth means to provide a difference of a particular intermediate frequency between the frequency of the carrier signals and the frequency of the signals from the oscillator, and

seventh means responsive to the carrier signals in the coaxial cable and the signals from the fifth means for providing the signals at the particular intermediate frequency.

8. In a combination as set forth in claim 7,

means responsive to the signals from the first means for regulating the gain of the analog signals converted by the first means to the corresponding digital signals.

9. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the coaxial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the coaxial cable, and

fourth means responsive to the signals from the third means for providing a closed loop servo with the third means for locking the phases of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the coaxial cable.

10. In a combination as set forth in claim 9,

the third means including means for derotating the digital signals in the pair.

11. In a combination as set forth in claim 9,

the third means including a feed forward equalizer and a decision feedback equalizer and a pair of slicers each operable on an individual one of the digital signals in the pair to slice the digital signals into the closest of a number of binary values.

12. In a combination as set forth in claim 11,

the third means including fifth means for derotating the digital signals in the pair,

the fourth means being responsive to the derotated signals from the third means and to the digital signals from the slicers in the pair to lock the phases of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the coaxial cable.

13. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data at a particular baud rate to recover

the quadrature amplitude modulated data from noise and distortions in the coaxial cable,

first means for converting the analog signals to digital signals at a variable rate,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the coaxial cable, and

fourth means responsive to the signals from the third means for varying the rate of converting the analog signals to the digital signals to provide the digital signals at a rate having a particular relationship to the particular baud rate.

14. In a combination as set forth in claim 13,

the third means including means for derotating the digital signals in the pair.

15. In a combination as set forth in claim 13,

the third means including a feed forward equalizer and a decision feedback equalizer and a pair of slicers each operable on an individual one of the digital signals in the pair to slice the digital signals into the closest of a number of binary values.

16. In a combination as set forth in claim 15,

the third means including fifth means for derotating the digital signals in the pair,

the fourth means being responsive to the derotated signals from the third means and to the digital signals from the slicers in the pair to lock the phases of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the coaxial cable.

17. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data on a carrier signal of a particular frequency to recover the quadrature amplitude modulated data from noise and distortions in the coaxial cable,

first means for converting the intermediate frequency analog signals in the receiver to digital signals at a variable rate,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the coaxial cable,

fourth means for providing an oscillator having a variable frequency, the fourth means being disposed before the first means in the combination, and

fifth means responsive to the digital signals from the third means for varying the frequency of the oscillator to obtain the production, from the mixing of the analog signals and the oscillator signals, of intermediate frequency signals having a particular frequency.

18. In a combination as set forth in claim 17,
the third means including means for derotating the digital signals in the pair.

19. In a combination as set forth in claim 17,
the third means including a feed forward equalizer and a decision feedback equalizer and a pair of slicers each operable on an individual one of the digital signals in the pair to slice the digital signals into the closest of a number of binary values.

20. In a combination as set forth in claim 19,
the third means including fifth means for derotating the digital signals in the pair,
the fourth means being responsive to the derotated signals from the third means and to the digital signals from the slicers in the pair to lock the variable frequency of the oscillator to obtain the production, from the mixing of the analog signals and the oscillator signals, of intermediate frequency signals having a particular frequency.

21. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data at a particular baud rate to recover the quadrature amplitude modulated data from noise and distortions in the coaxial cable,
first means for converting the analog signals to digital signals at a variable rate,
second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the coaxial cable,

fourth means responsive to the signals from the third means for providing a first closed loop servo with the third means for adjusting the operation of the first means to a rate having a particular relationship to the particular baud rate, and

fifth means responsive to the signals from the third means for providing a second closed loop servo with the third means for locking the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the transmitter.

22. In a combination as set forth in claim 21,

the fourth means including a first digital-to-analog converter for converting the digital signals from the third means to corresponding analog signals for adjusting the operation of the first means to a rate having the particular relationship to the particular baud rate, and

the fifth means including a second digital-to-analog converter for converting the digital signals from the third means to corresponding analog signals for locking the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the coaxial cable.

23. In a combination as set forth in claim 21,

means responsive to the digital signals from the first means for regulating the amplitude of the digital signals.

24. In a combination as set forth in claim 21,

the quadrature amplitude modulated analog signals in the coaxial cable including carrier signals at a particular frequency, and

sixth means for providing signals having a variable frequency, and

seventh means responsive to the pair of the digital signals from the third means for varying the frequency of the signals from the sixth means to obtain, upon a mixture of the signals from the sixth means and the carrier signals, intermediate frequency signals having a particular frequency.

25. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data at a particular carrier frequency to recover the quadrature amplitude modulated data from noise and distortions in the coaxial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the coaxial cable,

fourth means responsive to the signals from the third means for providing a first closed loop with the third means for locking the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the coaxial cable,

fifth means for providing signals having a variable frequency, and

sixth means responsive to the signals from the third means for providing a second closed loop with the third means for varying the frequency of the signals from the fifth means to obtain, upon a mixture of the signals at the carrier frequency and the signals having the variable frequency, intermediate frequency signals having a particular frequency.

26. In a combination as set forth in claim 25,

the fourth means including a first digital-to-analog converter for converting the pair of the digital signals from the third means to corresponding analog signals for adjusting the operation of the third means to lock the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the coaxial cable,

the sixth means including a second digital-to-analog converter for converting the digital signals from the third means to corresponding analog signals for locking the frequency of the signals from the fifth means relative to the carrier frequency for obtaining the intermediate frequency signals with a particular frequency.

27. In a combination as set forth in claim 25,

means responsive to the analog signals from the first means for regulating the amplitude of the analog signals.

28. In a combination as set forth in claim 25,

the third means including seventh means for derotating the digital signals in the pair and further

including eighth means for equalizing the derotated digital signals in the pair from the seventh means.

29. In a combination as set forth in claim 26,

seventh means responsive to the analog signals from the first means for regulating the amplitude of the analog signals, and

the third means including eighth means for derotating the digital signals in the pair and further including ninth means for equalizing the derotated digital signals in the pair from the eighth means.

30. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the coaxial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair, and

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the coaxial cable, the third means including a feed forward equalizer and a decision feedback equalizer, the decision feedback equalizer including a pair of slicers each operable on an individual one of the digital signals in the pair to slice the digital signals into the closest of a number of binary values, the number being progressively increased with time.

31. In a combination as set forth in claim 30,
the decision feedback equalizer having an output connected to the feed forward equalizer to control the operation of the feed forward equalizer in accordance with the operation of the decision feedback equalizer.

32. In a combination as set forth in claim 31,
a second pair of slicers,
the third means including a pair of adders each operative to receive the output of the decision feedback equalizer and the output of the feed forward equalizer and each operative to introduce its output to an individual one of the slicers in the second pair.

33. In a combination as set forth in claim 32,
means responsive to the output from the third means for feeding the output back to the third means to facilitate the adjustment of the amplitudes and phases of the digital signals in the pair to conform to the amplitudes and phases of the quadrature amplitude modulated signals in the transmitter.

34. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the coaxial cable,
first means for converting the analog signals to corresponding digital signals,
second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the coaxial cable,

the third means including fourth means for derotating the phases of the digital signals in the pair and including fifth means for providing a feed forward equalization of the derotated digital signals in the pair and including sixth means for providing a decision feedback equalization of the signals from the fifth means.

35. In a combination as set forth in claim 34,

means for feeding the signals from the sixth means back to the fifth means to enhance the feed forward equalization provided by the fifth means.

36. In a combination as set forth in claim 34,

the decision feedback equalizer including a pair of slicers each operable on an individual one of the digital signals in the pair to slice the digital signals into the closest of a number of binary values, the number being progressively increased with time.

37. In a combination as set forth in claim 36,

a pair of adders each operatively coupled to the feed forward equalizer and the decision feedback equalizer to operate upon one of the digital signals in the pair, and

a pair of additional slicers each operatively coupled to an individual one of the adders in the pair to provide an output of one of the digital signals in the pair without the noise and distortion in the coaxial cable.

38. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the coaxial cable,

first means for converting the analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the coaxial cable,

the third means including fourth means for derotating the phases of the digital signals in the pair and including fifth means for equalizing the derotated digital signals in the pair.

39. In a combination as set forth in claim 37,

means responsive to the derotated digital signals in the pair and to the equalized digital signals in the pair for operating upon the fourth means to facilitate the derotation of the digital signals in the pair by the fourth means.

40. In a combination as set forth in claim 37,

the quadrature amplitude modulated signals in the coaxial cable having a particular baud rate, and

means responsive to the derotated digital signals and to the equalized digital signals for operating upon the first means to obtain the conversion of the analog signals to the digital signals at a rate having a particular relationship to the particular baud rate.

41. In a combination as set forth in claim 37,

the signals in the coaxial cable including carrier signals with a particular carrier frequency, and

an oscillator having a variable frequency, and

means responsive to the derotated digital signals and the equalized digital signals for varying the frequency of the oscillator to provide, upon a mixing of the analog signals and the signals from the oscillator, intermediate frequency signals having a particular frequency.

42. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the coaxial cable,

first means for converting the analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the coaxial cable,

the third means a sequential arrangement of a derotator, a feed forward equalizer and a decision feedback equalizer.

43. In a combination as recited in claim 41,

means responsive initially to the outputs of the derotator and the decision feedback equalizer, and subsequently to signals from the decision feedback equalizer,

for operating upon the derotator to facilitate the derotation of the phases of the digital signals in the pair.

44. In a combination as set forth in claim 41,

the quadrature amplitude modulated signals in the coaxial cable having a particular baud rate, and

means responsive to the outputs of the derotator and the decision feedback equalizer for operating upon the first means to obtain the conversion of the analog to the digital signals at a rate having a particular relationship to the particular baud rate.

45. In a combination as set forth in claim 41,

the signals in the coaxial cable including carrier signals with a particular carrier frequency,

an oscillator having a variable frequency, and

means responsive initially to the outputs of the derotator and the decision feedback equalizer, and subsequently to signals the decision feedback equalizer, for varying the frequency of the oscillator to obtain, upon a mixing of the carrier signals and the signals from the oscillator, intermediate frequency signals having a particular frequency.

46. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulation data to recover the quadrature amplitude modulated data from noise and distortion in the coaxial cable,

first means for converting the analog signals in the coaxial cable to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital

signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated data in the coaxial line,

the third means including a feed forward equalizer and a decision feedback equalizer and means for combining the outputs of the feed forward equalizer and the decision feedback equalizer to obtain resultant soft decisions and including means for slicing the resultant decisions to obtain the quadrature amplitude modulated data free from noise and distortions.

47. In a combination as set forth in claim 46,

the decision feedback equalizer including an additional slicer connected to receive the output of the combining means and to provide, at progressive instants of time, binary outputs of progressive sensitivity and including means for determining any difference between the output of the combining means and the binary outputs of progressive sensitivity and including means for introducing the difference determinations to the feed forward equalizer and decision feedback equalizer to enhance the equalizing operation of the feed forward equalizer and the decision feedback equalizer.

48. In a combination as set forth in claim 46,

means responsive to the outputs of the decision feedback equalizer and the slicers for providing a closed loop servo to enhance the operation of the third means in producing the quadrature amplitude modulated data without noise and distortions.

49. In a combination as set forth in claim 46,

the quadrature amplitude modulated signals in the coaxial cable occurring at a particular baud rate, and

means responsive to the outputs of the derotator and the slicers for providing a closed loop servo to provide for the operation of the first means in converting the analog signals to the digital signals at a rate having a particular relationship to the particular baud rate.

50. In a combination as set forth in claim 46,

the quadrature amplitude modulated signals in the coaxial cable having a particular carrier frequency, and

an oscillator having a variable frequency, and

means responsive to the outputs of the feed forward equalizer and the decision feedback equalizer for varying the frequency of the oscillator to provide, upon a mixing of the signals at the particular carrier frequency and the oscillator signals, intermediate frequency signals having a particular frequency.

51. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the coaxial cable,

first means for converting the intermediate analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for derotating the phases of the digital signals in the pair, and

fourth means disposed in a symmetrical relationship to the derotated digital signals in the pair from the third means for equalizing the derotated digital signals in the pair.

52. In a combination as set forth in claim 51,

means responsive to the signals from the third means and the fourth means for providing a closed loop servo for facilitating the derotation by the third means of the digital signals in the pair.

53. In a combination as set forth in claim 51,

the quadrature amplitude modulated signals in the coaxial cable having a particular baud rate, and

means responsive to the signals from the third means and the fourth means for providing a closed loop servo for providing for the operation of the first means at a rate having a particular relationship to the particular baud rate in converting the analog signals in the coaxial cable to the corresponding digital signals.

54. In a combination as set forth in claim 51,

the quadrature amplitude modulated signals in the coaxial cable having a particular carrier frequency,

an oscillator having a variable carrier frequency, and

means responsive to the signals from the third means and the fourth means for providing a closed loop servo for maintaining the oscillator at a frequency related to the particular carrier frequency,

the oscillator being connected in the coaxial cable before the operation of the first means in converting the analog signals in the receiver to the corresponding digital signals.

55. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the coaxial cable,

there being a plurality of stations each having an individual carrier frequency and each providing quadrature amplitude modulated signals in the coaxial cable,

first means for converting the analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable, and

fourth means responsive to the output from the third means for providing a closed loop servo with the third means for facilitating the recovery of the quadrature amplitude modulated data from the noise and distortions in the coaxial cable,

the fourth means initially having a first response for a first period of time after switching from a first one of the stations in the plurality to a second one of the stations in the plurality to facilitate the recovery of an intermediate

frequency signal having a particular frequency from the carrier frequency of the second one of the stations in the plurality and subsequently having a second response after the first period of time to facilitate the recovery of the quadrature amplitude modulated data for the second one of the stations in the plurality from the noise and distortions in the coaxial cable.

56. In a combination as set forth in claim 55,

the fourth means including means for converting the digital indications from the third means to analog signals for facilitating the recovery of the quadrature amplitude modulated data for the second one of the stations in the plurality from the noise and distortions in the coaxial cable.

57. In a combination as set forth in claim 55,

the fourth means being responsive to the digital signals from the third means for adjusting the phases of the digital signals in the pair to facilitate the recovery of the quadrature amplitude modulated data for the second one of the stations in the plurality from the noise and distortions in the coaxial cable.

58. In a combination as set fort in claim 55,

fifth means for providing an oscillator with a variable frequency,

the fourth means being responsive to the digital signals from the third means for adjusting the frequency of the oscillator in the fifth means relative to the carrier frequency of the second one of the stations in the plurality to facilitate the recovery of the intermediate frequency signal with the particular frequency for the second one of the

stations in the plurality from the noise and distortions in the coaxial cable.

59. In a combination as set forth in claim 58,

the intermediate frequency signals being sampled at a rate having a particular relationship to the particular baud rate,

the fourth means being responsive to the digital signals from the third means for adjusting, to a rate having a particular relationship to the particular baud rate, the operation of the first means in converting the analog signals to the digital signals.

60. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable,

first means for converting the analog signals in the coaxial cable to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable,

the third means including a feed forward equalizer,

the third means including slicer means operative upon the digital signals in individual ones of the pairs to conform such digital signals to the closest of individual ones

of a plurality of different levels, the slicer means being operative at successive periods of time to provide progressive numbers of levels in the plurality for conforming such digital signals,

means responsive to the outputs of the decision feedback equalizer and the slicer means for producing an error signal, and

means for feeding the error signal back to the feed forward equalizer and the decision feedback equalizer for adjusting the operation of the feed forward equalizer and decision feedback equalizer in accordance with such error signal.

61. In combination for operating upon analog signals transmitted through a coaxial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable,

first means for converting the analog signals in the coaxial cable to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable,

the third means including a feed forward equalizer,

the third means including slicer means operative upon the digital signals in individual ones of the pairs to conform such digital signals to the closest of individual ones

of a plurality of different levels, the slicer means being operative at successive periods of time to provide progressive numbers of levels in the plurality for conforming such digital signals,

means responsive to the outputs of the decision feedback equalizer and the slicer means for producing an error signal, and

means for feeding the error signal back to the feed forward equalizer and the decision feedback equalizer for adjusting the operation of the feed forward equalizer and decision feedback equalizer in accordance with such error signal.

62. In a combination as set forth in claim 61,

means responsive to the outputs of the decision feedback equalizer and the slicer means for combining such outputs, and

a pair of additional slicer means each responsive to the combined outputs of the decision feedback equalizer and the slicer means for providing the quadrature amplitude modulated data without the noise and distortions in the coaxial cable.

63. In a combination as set forth in claim 62,

means responsive to the quadrature amplitude modulated data in the third means and the quadrature amplitude modulated data from the additional slicer means for feeding signals back to the third means to facilitate the recovery of the quadrature amplitude modulated data by the third means.

64. In a combination as set forth in claim 60,

the analog signals occurring at a particular baud rate, and

means responsive to the quadrature amplitude modulated data in the third means and the quadrature amplitude modulated data from the additional slicer means for controlling the operation of the first means to provide for the conversion of the analog signals to the digital signals at a rate having a particular relationship to the particular baud rate.

65. In a combination as set forth in claim 62,

there being a carrier signal at a particular frequency for the quadrature amplitude modulated signals in the coaxial cable,

an oscillator having a variable frequency, and

means responsive to the quadrature amplitude modulated data in the third means and the quadrature amplitude modulated data from the additional slicer means for varying the frequency of the oscillator to obtain, from a mixing of the carrier signal and the signal from the local oscillator, an intermediate frequency signal having a particular frequency.

66. In combination for operating upon analog signals transmitted through a cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable,

there being a plurality of stations each having an individual carrier frequency and each providing quadrature amplitude modulated signals in the coaxial cable,

first means for converting the analog signals in the coaxial cable to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable, and

fourth means responsive to the indications from the first means for regulating the gain of the analog signals before the conversion of the analog signals to the digital signals by the first means, the fourth means having a first response for a first period of time after switching from a first one of the stations in the plurality to a second one of the stations in the plurality and subsequently having a second response after the first period of time to facilitate the recovery of the quadrature amplitude modulated data for the second one of the stations in the plurality from the noise and distortions in the coaxial cable.

67. In a combination as set forth in claim 64,

the fourth means being responsive to every digital conversion by the first means for the first period of time and being responsive to every nth conversion by the first means after the first period of time where n is an integer greater than 1.

68. In a combination as set forth in claim 66,

the fourth means including means for converting the digital indications from the first means to analog indications

for regulating the gain of the analog signals in the coaxial cable.

69. In a combination as set forth in claim 66,
the analog signals having a particular baud rate, and
means for regulating the rate of conversion by the first means of the analog signals to the digital signals to correspond to a rate having a particular relationship to the baud rate of the analog signals.

70. In a combination as set forth in claim 66,
the analog signals having a particular carrier frequency,
an oscillator having a variable frequency,
means for mixing the signals from the oscillator with the analog signals in the coaxial cable before the conversion of the analog signals to the digital signals by the first means, and
means for regulating the variable frequency of the oscillator to obtain from the mixing an intermediate frequency signal having a particular frequency.

71. In combination for acting upon analog signals transmitted through a cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable,
first means for converting the analog signals in the coaxial cable to corresponding digital signals,
second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital

signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable,

the third means including a feed forward equalizer and a decision feedback equalizer connected to receive the output of the feed forward equalizer and including means for feeding the output of the decision feedback equalizer to the feed forward equalizer to regulate the operation of the feed forward equalizer in adjusting the amplitudes and phases of the digital signals in the pair to recover the quadrature amplitude modulated data from the noise and distortions in the coaxial cable.

72. In a combination as set forth in claim 71,

means for adding the outputs of the feed forward equalizer and the decision feedback equalizer, and

means responsive to the outputs of the adding means for providing the quadrature amplitude modulated data without the noise and distortions in the coaxial cable.

73. In a combination as set forth in claim 71,

the decision feedback equalizer having a pair of slicers each operative to provide outputs of increased sensitivity at progressive instants of time and including means responsive to the outputs of the slicers and the outputs of the decision feedback equalizers for producing error signals for regulating the operation of the feed forward equalizer and decision feedback equalizer.

74. In a combination as set forth in claim 73,

a second pair of slicers responsive to the outputs of the feed forward equalizer and the decision feedback equalizer for combining these outputs to obtain the quadrature amplitude modulated data without the noise and distortions in the coaxial cable.